WHAT IS CLAIMED IS:

1. A picture synthesizing apparatus comprising: image pickup means disposed in a car; viewpoint change image synthesizing means for changing a viewpoint of an image obtained by said image pickup means and synthesizing the image; car locus line generation means for generating at least one of a locus line at an arbitrary height of said car and a vertical line; and car locus line drawing means for drawing the locus line generated by said car locus line generation means on the image synthesized by said viewpoint change image synthesizing means.

2. The picture synthesizing apparatus according to claim 1 wherein said car locus line generation means comprises three-dimensional locus line generation means, road surface projection means, and synthesized image projection means.

3. The picture synthesizing apparatus according to claim 1 wherein said car locus line generation means generates a locus line in a case in which said car linearly advances.

4. The picture synthesizing apparatus according to claim 1, further comprising steering angle information output means for outputting a steering wheel angle of said car, wherein said car locus line generation means generates the locus line in

accordance with steering angle information outputted by said steering angle information output means.

5. The picture synthesizing apparatus according to claim 1 which has a function of interpolating a locus line on a road surface of said car and the locus line at the arbitrary height with a straight line or a curved line, and drawing a line vertical to said road surface on said synthesized image.

6. The picture synthesizing apparatus according to claim 1 which has a function of drawing a locus line of a bumper end of said car or a locus line of a car height on said synthesized image.

7. The picture synthesizing apparatus according to claim 1 which has a function of changing a color or a thickness of said locus line in accordance with a distance from said car and drawing the locus line.

8. The picture synthesizing apparatus according to claim 4 which has a function of drawing a section of said car moved apart from a rear end of said car along said locus line with an elapse of time on said synthesized image.

9. The picture synthesizing apparatus according to claim

4 which has a function of drawing a solid diagram of said car moved apart from a rear end of said car along said locus line with an elapse of time on said synthesized image.

5   10.   The picture synthesizing apparatus according to claim 4 wherein said car locus line generation means comprises three-dimensional shape storage means, three-dimensional locus region generation means, road surface projection means, and synthesized image projection means.

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11.   The picture synthesizing apparatus according to claim 10 wherein said three-dimensional shape storage means stores a shape of said car.

15   12.   The picture synthesizing apparatus according to claim 10 wherein said three-dimensional shape storage means stores a shape of a rectangular parallelepiped inscribed by said car.

20   13.   The picture synthesizing apparatus according to claim 10 wherein said three-dimensional shape storage means stores a shape of a wheel of said car.

14.   The picture synthesizing apparatus according to claim 10 wherein said three-dimensional shape storage means

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stores a shape of a bumper of said car.

15.   The picture synthesizing apparatus according to claim 4, further comprising obstacle collision prediction means for detecting an obstacle present around said car, and predicting a possibility of collision of said car with said obstacle.

16.   The picture synthesizing apparatus according to claim 15 wherein said car locus line drawing means does not draw the locus line of said car ahead of a collision place, when said obstacle collision prediction means predicts the collision of said car with said obstacle.

17.   The picture synthesizing apparatus according to claim 15 wherein said car locus line drawing means emphasizes and displays a collision place, when said obstacle collision prediction means predicts the collision of said car with said obstacle.

18.   The picture synthesizing apparatus according to claim 4, further comprising multi-screen generation means for displaying the image synthesized by said viewpoint change image synthesizing means in a multiplicity of divided screens.

19.   The picture synthesizing apparatus according to

claim 18 wherein said car locus line drawing means draws a locus of the car in each screen generated by said multi-screen generation means.

5   20.   The picture synthesizing apparatus according to claim 18 wherein said image pickup means includes means for picking up an image behind said car, and means for picking up an image beside said car.

10   21.   The picture synthesizing apparatus according to claim 18 wherein said car locus line drawing means draws a locus line of a rear end of said car on an image beside said car, or an image obtained by converting said image beside the car.

15   22.   The picture synthesizing apparatus according to claim 19 wherein said car locus line drawing means draws the locus line or a car frame indicating the same position in the same color in different screens, when said locus line is drawn in a plurality of screens.

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23.   A picture synthesizing apparatus comprising: image pickup means disposed in a car; viewpoint change image synthesizing means for changing a viewpoint of an image obtained by said image pickup means and synthesizing the image; auxiliary
25   line generation means for generating an auxiliary line of an

arbitrary position from said car; and auxiliary line drawing means for drawing the auxiliary line generated by said auxiliary line generation means on the image synthesized by said viewpoint change image synthesizing means.

24. The picture synthesizing apparatus according to claim 23, further comprising multi-screen generation means for displaying the image synthesized by said viewpoint change image synthesizing means in a multiplicity of divided screens, wherein said auxiliary line drawing means draws the generated auxiliary line in each screen generated by said multi-screen generation means.

25. The picture synthesizing apparatus according to claim 23 wherein said auxiliary line generation means generates an auxiliary line indicating a position of a rear end of said car.

26. The picture synthesizing apparatus according to claim 23 wherein said auxiliary line generation means generates an auxiliary line indicating a constant distance from a rear end of said car.

27. The picture synthesizing apparatus according to claim 23 wherein said auxiliary line generation means generates

an auxiliary line indicating a width of a general car.

28. A picture synthesizing apparatus comprising: image
pickup means disposed in a car so that a rear part of said car
5   is positioned in a view field; viewpoint change image
synthesizing means for changing a viewpoint of an image obtained
by said image pickup means and synthesizing the image including
an image of said car; storage means for storing predetermined
data beforehand; and drawing means for superimposing
10 predetermined auxiliary data upon the image synthesized by said
viewpoint change image synthesizing means based on the data read
from said storage means.

29. The picture synthesizing apparatus according to
15 claim 28 which has a function of superimposing an auxiliary line
upon a rear edge of said car, and providing an image
emphasizing/indicating the corresponding position.

30. The picture synthesizing apparatus according to
20 claim 28 which has a function of providing an image showing a
three-dimensional illustration prepared as if the image of said
car were picked up by an actually disposed image pickup unit
and converted/synthesized.

25   31. The picture synthesizing apparatus according to

claim 28 which has a function of representing said car by an illustration of a skeleton or a wire frame, and providing an image explicitly indicating a tire position.

5   32.   The picture synthesizing apparatus according to claim 31 which has a function of providing an image obtained by transforming/synthesizing an image actually obtained by said image pickup means in a region corresponding to a bumper of the illustration.

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      33.   The picture synthesizing apparatus according to claim 28 which has a function of superimposing an illustration of two wall surfaces disposed vertically to a road surface in a rear end position of said car, and on an inner side of the 15   rear end position of said car, and having the same width as a width of said car upon a displayed image, and providing an image metaphorically representing said car as a solid object.

      34.   The picture synthesizing apparatus according to 20   claim 28 which has a function of providing an image showing a mirror confirmation line behind a rear end of a bumper of said car by a constant distance and horizontally with said bumper.

      35.   The picture synthesizing apparatus according to 25   claim 28 which has a function of providing an image including

a road surface passage locus indicating a position obtained by projecting a position passed by a body end of said car onto a road surface, and a bumper end passage locus indicating a position passed by a bumper end of said car, when said car moves

5   backwards, and a solid auxiliary line for connecting the loci to produce a solid sense.

36.   The picture synthesizing apparatus according to claim 35 which has a function of providing an image showing said

10   road surface passage locus like a tire trace, and indicating the bumper end passage locus connected to a bumper end of an actual image or an illustration of said car.

37.   The picture synthesizing apparatus according to

15   claim 35 which has a function of providing an image showing said road surface passage locus drawn from a tire explicitly indicated in an illustration.

38.   The picture synthesizing apparatus according to

20   claim 37 which has a function of providing an image showing a mirror confirmation line behind a rear end of a bumper of said car by a constant distance and horizontally with said bumper.

39.   The picture synthesizing apparatus according to

25   claim 35 which further comprises a locus calculation unit to

calculate a predicted locus from a steering angle signal inputted from the outside, and which has a function of providing an image including a road surface passage locus corresponding to a steering angle of said car, a bumper end passage locus

5   corresponding to the steering angle of said car, and a solid auxiliary line for connecting the loci to produce a solid sense.

40.   The picture synthesizing apparatus according to claim 28 which has a function of providing an image

10   simultaneously showing a road surface passage locus, a bumper end passage locus, a passage locus indicating a position passed by an appropriate height portion of a body of said car, and an illustration imitating a rear part of the car, when said car moves backwards.

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41.   The picture synthesizing apparatus according to claim 40 which has a function of providing an image showing said road surface passage locus like a tire trace, and indicating said bumper end passage locus connected to a bumper end of an

20   actual image or an illustration.

42.   The picture synthesizing apparatus according to claim 40 which has a function of providing an image showing said road surface passage locus drawn from a tire explicitly indicated

25   in an illustration.

43. The picture synthesizing apparatus according to claim 42 which has a function of providing an image showing a mirror confirmation line behind a rear end of a bumper of said car by a constant distance and horizontally with said bumper.

44. The picture synthesizing apparatus according to claim 40 which further comprises a locus calculation unit to calculate a predicted locus from a steering angle signal inputted from the outside, and which has a function of providing an image simultaneously showing said road surface passage locus corresponding to a steering angle of said car, said bumper end passage locus corresponding to the steering angle of said car, a passage locus indicating a position passed by an appropriate height portion of a body of said car, and an illustration imitating a rear part of said car.

45. The picture synthesizing apparatus according to claim 28 which has a function of providing an image simultaneously showing a road surface passage locus, a bumper upper surface passage locus indicating a position passed by an end of a bumper upper surface of said car, a bumper lower surface passage locus indicating a position passed by an end of a bumper lower surface of said car, and an illustration imitating a rear part of said car, when said car moves backwards.

46. The picture synthesizing apparatus according to claim 45 which has a function of providing an image showing said road surface passage locus like a tire trace, and indicating

5   the bumper end passage locus connected to a bumper end of an actual image or an illustration of the car.

47. The picture synthesizing apparatus according to claim 45 which has a function of providing an image showing said

10 road surface passage locus drawn from a tire explicitly indicated in an illustration.

48. The picture synthesizing apparatus according to claim 47 which has a function of providing an image showing a

15 mirror confirmation line behind a rear end of a bumper of said car by a constant distance and horizontally with said bumper.

49. The picture synthesizing apparatus according to claim 45 which further comprises a locus calculation unit to

20 calculate a predicted locus from a steering angle signal inputted from the outside, and which has a function of providing an image simultaneously showing said road surface passage locus corresponding to a steering angle of said car, said bumper upper surface passage locus corresponding to the steering angle of

25 said car, said bumper lower surface passage locus corresponding

to the steering angle of said car, and an illustration imitating a bumper of said car.

50. An image synthesis/display apparatus comprising:

5 a picture synthesizing apparatus comprising: image pickup means disposed in a car; viewpoint change image synthesizing means for changing a viewpoint of an image obtained by said image pickup means and synthesizing the image; car locus line generation means for generating at least one of a locus line

10 at an arbitrary height of said car and a vertical line; and car locus line drawing means for drawing the locus line generated by said car locus line generation means on the image synthesized by said viewpoint change image synthesizing means;

display means for displaying the image synthesized by said

15 picture synthesizing apparatus; and

display data conversion means for converting said image to be displayed into data suitable for said display means.

51. An image synthesis/display apparatus comprising:

20 a picture synthesizing apparatus comprising: image pickup means disposed in a car; viewpoint change image synthesizing means for changing a viewpoint of an image obtained by said image pickup means and synthesizing the image; auxiliary line generation means for generating an auxiliary line of an arbitrary

25 position from said car; and auxiliary line drawing means for

drawing the auxiliary line generated by said auxiliary line generation means on the image synthesized by said viewpoint change image synthesizing means;

display means for displaying the image synthesized by said
5 picture synthesizing apparatus; and

display data conversion means for converting said image to be displayed into data suitable for said display means.

52. An image synthesis/display apparatus comprising:
10 a picture synthesizing apparatus comprising: image pickup means disposed in a car so that a rear part of said car is positioned in a view field; viewpoint change image synthesizing means for changing a viewpoint of an image obtained by said image pickup means and synthesizing the image including an image of
15 said car; storage means for storing predetermined data beforehand; and drawing means for superimposing predetermined auxiliary data upon the image synthesized by said viewpoint change image synthesizing means based on the data read from said storage means;

20 display means for displaying the image synthesized by said picture synthesizing apparatus; and

display data conversion means for converting said image to be displayed into data suitable for said display means.

25 53. An image acquirement warning apparatus comprising:

detection means for detecting an approaching state of a connection object connected to a car;

a picture synthesizing apparatus comprising: image pickup means disposed in said car and/or said connection object;

5 viewpoint change image synthesizing means for changing a viewpoint of an image obtained by said image pickup means and synthesizing the image; car locus line generation means for generating at least one of a locus line at an arbitrary height of said car and a vertical line; and car locus line drawing means

10 for drawing the locus line generated by said car locus line generation means on the image synthesized by said viewpoint change image synthesizing means; and

warning means for generating a warning signal from said approaching state obtained by said detection means and/or a

15 relation between said car and said connection object in the image synthesized by said picture synthesizing apparatus.

54. An image acquirement warning apparatus comprising:

detection means for detecting an approaching state of a

20 connection object connected to a car;

a picture synthesizing apparatus comprising: image pickup means disposed in said car and/or said connection object; viewpoint change image synthesizing means for changing a viewpoint of an image obtained by said image pickup means and

25 synthesizing the image; auxiliary line generation means for

generating an auxiliary line of an arbitrary position from said car; and auxiliary line drawing means for drawing the auxiliary line generated by said auxiliary line generation means on the image synthesized by said viewpoint change image synthesizing

5   means; and

.warning means for generating a warning signal from said approaching state obtained by said detection means and/or a relation between said car and said connection object in the image synthesized by said picture synthesizing apparatus.

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55. An image acquirement warning apparatus comprising:

detection means for detecting an approaching state of a connection object connected to a car;

a picture synthesizing apparatus comprising: image pickup

15   means disposed in said car and/or said connection object so that a rear part of said car is positioned in a view field; viewpoint change image synthesizing means for changing a viewpoint of an image obtained by said image pickup means and synthesizing the image including an image of said car; storage means for storing

20   predetermined data ˙beforehand; and drawing means for superimposing predetermined auxiliary data upon the image synthesized by said viewpoint change image synthesizing means based on the data read from said storage means; and

warning means for generating a warning signal from said

25   approaching state obtained by said detection means and/or a

relation between said car and said connection object in the image synthesized by said picture synthesizing apparatus.

56.   The image acquirement warning apparatus according to any one of claims 53 to 55, further comprising warning signal generation condition setting means for a user to arbitrarily set a condition for generating the warning signal by said warning means.

57.   A car position recognition apparatus comprising:

a picture synthesizing apparatus comprising: a plurality of image pickup means disposed in a car, and including rear image pickup means for picking up an image behind said car; viewpoint change image synthesizing means for changing a viewpoint of an image obtained by said image pickup means and synthesizing the image; car locus line generation means for generating at least one of a locus line at an arbitrary height of said car and a vertical line; and car locus line drawing means for drawing the locus line generated by said car locus line generation means on the image synthesized by said viewpoint change image synthesizing means;

image detection means for detecting an image of an arbitrary object from the image obtained by said rear image pickup means or the image synthesized by said picture synthesizing apparatus;

recognition means for recognizing a position relation between the image detected by said image detection means and the image of said car; and

comparison means for comparing said position relation

5   recognized by said recognition means with a predetermined position relation, and detecting a deviation amount between the position relations from the position relations.

58.   A car position recognition apparatus comprising:

10   a picture synthesizing apparatus comprising: a plurality of image pickup means disposed in a car, and including rear image pickup means for picking up an image behind said car; viewpoint change image synthesizing means for changing a viewpoint of an image obtained by said image pickup means and synthesizing the

15   image; auxiliary line generation means for generating an auxiliary line of an arbitrary position from said car; and auxiliary line drawing means for drawing the auxiliary line generated by said auxiliary line generation means on the image synthesized by said viewpoint change image synthesizing means;

20   image detection means for detecting an image of an arbitrary object from the image obtained by said rear image pickup means or the image synthesized by said picture synthesizing apparatus;

recognition means for recognizing a position relation

25   between the image detected by said image detection means and

the image of said car; and

comparison means for comparing said position relation recognized by said recognition means with a predetermined position relation, and detecting a deviation amount between the

5 position relations from the position relations.

59. A car position recognition apparatus comprising:

a picture synthesizing apparatus comprising: a plurality of image pickup means disposed in a car, including rear image

10 pickup means for picking up an image behind said car, and disposed so that a rear part of said car is positioned in a view field; viewpoint change image synthesizing means for changing a viewpoint of an image obtained by said image pickup means and synthesizing the image including an image of said car; storage

15 means for storing predetermined data beforehand; and drawing means for superimposing predetermined auxiliary data upon the image synthesized by said viewpoint change image synthesizing means based on the data read from said storage means;

image detection means for detecting an image of an

20 arbitrary object from the image obtained by said rear image pickup means or the image synthesized by said picture synthesizing apparatus;

recognition means for recognizing a position relation between the image detected by said image detection means and

25 the image of said car; and

comparison means for comparing said position relation recognized by said recognition means with a predetermined position relation, and detecting a deviation amount between the position relations from the position relations.